EXAMINER'S AMENDMENT

An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Joseph Gortych on 2-6-09.

Claims 3, 8-10, 13 remain as filed by Applicant on 1/2/09.

The application has been amended by cancelling claim 4 and replacing claims 1, 2, 5-7, 11, 12, and 14-20 as follows.

1. A method of autocalibrating a quantum key distribution (QKD) system having first and second QKD encoding stations, a laser and a single-photon detector (SPD) unit, comprising:

a) performing laser gate scanning by:

i) sending laser gating signals to the laser to cause the laser to generate photon signals;

ii) varying an arrival time T of the laser gating signals over a first range R1 to vary times at which the photon signals are generated;

iii) exchanging the photons signals between the first and second QKD encoding stations and performing first and second encodings of the photon signals at the first and second QKD stations, respectively;

iv) detecting a combination of the first and second encoded photon signals at the SPD unit in one of the first and second QKD encoding stations so as to generate photon counts and determining an optimal arrival time T_{MAX} of the laser gating signals that corresponds to a first optimum number of photon counts; and

b) performing laser gate dithering by varying the arrival time T of the laser gating signals over a second range R2 surrounding T_{MAX} to maintain either the first optimum number of photon counts or a second optimum number of photon counts.

2. The method of claim 1, wherein at least one of the first and second optimum number of photon counts is/are either a maximum number of detected photons N_{MAX}, or a maximum of the total number of photon counts N detected over a time interval divided by a number of double-clicks from the SPD unit over the time interval.

4. (Cancelled).

5. A computer-readable medium having instructions embodied therein that, when executed by a computer in a quantum key distribution (QKD) system having first and second QKD encoding stations and a laser, cause the computer to perform the following method of actively autocalibrating the QKD system:

a) performing laser gate scanning by:

i) sending laser gating signals to the laser to cause the laser to generate photon signals;

ii) varying an arrival time T of the laser gating signals over a first range R1 to vary times at which the photon signals are generated;

iii) exchanging the photons signals between the first and second QKD encoding stations and encoding the photon signals at the first and second QKD encoding stations, respectively;

iv) detecting a combination of the first and second encoded photon signals at the SPD unit in one of the QKD encoding stations to generate photon counts and

determining an optimal arrival time T_{MAX} of the laser gating signals that corresponds to an optimum number of photon counts from the SPD unit; and

b) performing laser gate dithering by varying the arrival time T of the laser gating signals over a second range R2 surrounding T_{MAX} to maintain the optimum number of photon counts.

6. The computer-readable medium of claim 5, wherein the optimum number of photon counts is either:

a maximum number of photons N_{MAX}, or a maximum of the total number of photon counts N over a time interval divided by a number of double-clicks from the SPD unit over the time interval.

7. A method of exchanging photon signals in a quantum key distribution (QKD) system having a laser and a single-photon detector (SPD) unit both operably coupled to a controller, comprising:

encoding and exchanging the photon signals between first and second QKD encoding stations in the QKD system, where the photon signals are generated by the laser in response to laser gating signals;

performing a first laser gate scan by sending the laser gating signals from the controller to the laser over a range R1 of laser gating signal arrival times T;

establishing from the first laser gate scan a first optimal arrival time T_{MAX} for the laser gating signal corresponding to a first maximum number of photon counts N_{MAX} from detecting the encoded photon signals at the SPD unit;

terminating the first laser gate scan when the first optimal arrive time T_{MAX} is established; and

performing a first laser gate dither by altering the arrival time T over a range of arrival times R2 about the first optimal arrival time T_{MAX} to maintain either the first maximum number of photon counts N_{MAX} or a different maximum number of photon counts N'_{MAX} over the range R2.

11. A computer-readable medium having instructions embodied therein that, when executed by a computer in a quantum key distribution (QKD) system, cause the computer to perform the following method of actively autocalibrating the QKD system, the method comprising:

sending photon signals between first and second QKD encoding stations in the QKD system, wherein the photon signals are generated by a laser in response to laser gating signals having associated arrival times T at the laser and respectively encoded by the first and second QKD encoding stations to form encoded photon signals;

performing a first laser gate scan by varying the arrival time T over a first range of arrival times R1 to establish a first optimal arrival time T_{MAX} corresponding to a first maximum number of photon counts N_{MAX} from a detector unit in one of the QKD encoding stations and that is configured to detect a combination of the encoded photon signals;

terminating the first laser gate scan when the first T_{MAX} is established; and

performing a first laser gate dither by altering the arrival time T over a second range of arrival times R2 < R1 about the first T_{MAX} to maintain either a) the first maximum number of photon counts N_{MAX}, or b) a different maximum number of photon counts N'_{MAX} over the second range R2.

12. A method of autocalibrating a quantum key distribution (QKD) system having a laser, a single-photon detector (SPD) unit and controller operably coupled to the laser and the SPD unit, comprising:

generating photon signals with the laser by activating the laser with laser gating signals sent from the controller, the laser gating signals having an associated laser gating signal timing T;

sending the photon signals between first and second QKD encoding stations in the QKD system so as to encode the photon signals;

performing a first laser gate scan to determine an optimum arrival time T_{MAX} for the laser gating signals to arrive at the laser by obtaining a first optimum number of photon counts of combined encoded photon signals detected at the SPD unit;

terminating the first laser gate scan when T_{MAX} is determined; and

periodically dithering the laser gating signal arrival time about T_{MAX} to maintain either the first optimum number of photon counts or a second optimum number of photon counts.

14. The method of claim 12, wherein at least one of the first and second optimum number of photon counts is a maximum number of photon counts.

15. A method of actively autocalibrating a quantum key distribution (QKD) system having first and second QKD encoding stations, and a laser coupled to a controller in one of the encoding stations, the method comprising:

generating photon signals from the laser by sending laser gating signals from the controller to the laser;

exchanging the photons signals between the first and second QKD encoding stations and performing first and second encodings of the photon signals at the first and second encoding stations, respectively, thereby forming encoded photon signals;

establishing an optimum arrival time of the laser gating signals that corresponds to a first optimum number of photon counts from a single-photon detector (SPD) unit in one of the QKD encoding stations;

terminating the laser gate scan; and

varying the arrival time of the laser gating signals around the optimal arrival time in order to provide minor adjustments to the arrival time that lead to the SPD unit yielding either the first optimum number of photon counts, or a second optimum number of photon counts.

16. The method of claim 15, wherein at least one of the first and second optimum number of photon counts is either a maximum number of photon counts, or a maximum of a total number of photon counts for a given interval divided by a number of double-clicks in the same interval.

17. The method of claim 1, wherein the photon signals are phase-encoded by a first phase modulator in the first QKD encoding station and a second phase modulator in the second QKD encoding station.

18. The method of claim 1, further including:

encoding a first photon signal in the first QKD encoding station;

encoding a second photon signal in the second QKD encoding station; and

interfering the first and second encoded photon signals to form the combination of the first and second encoded photon signals.

19. The method of claim 12, including generating the photon signals and detecting the encoded photon signals in the same QKD encoding station.

20. The method of claim 15, including generating the photon signals and detecting the encoded photon signals in the same QKD encoding station.

Oath/Declaration

Applicant is now required to submit a substitute declaration or oath to correct the deficiencies set forth; the first inventor's signature is not visible. The substitute oath or declaration must be filed within the THREE MONTH shortened statutory period set for reply in the "Notice of Allowability" (PTO-37). Extensions of time may NOT be obtained under the provisions of 37 CFR 1.136. Failure to timely file the substitute declaration (or oath) will result in **ABANDONMENT** of the application. The transmittal letter accompanying the declaration (or oath) should indicate the date of the "Notice of Allowance" (PTOL-85) and the application number in the upper right hand corner.

Reasons for Allowance

The following is an examiner's statement of reasons for allowance:

Applicant's arguments, filed 1/02/09, with respect to claims 1-3 and 5-20 have been fully considered and are persuasive. The rejection of claims 1-3 and 5-20 has been withdrawn.

Allowable Subject Matter

Claims 1-3 and 5-20 allowed.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to MICHAEL R. VAUGHAN whose telephone number is (571)270-7316. The examiner can normally be reached on Monday - Thursday, 7:30am - 5:00pm, EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kim Vu can be reached on 571-272-3859. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/M. R. V./
Examiner, Art Unit 2431

/Syed Zia/
Primary Examiner, Art Unit 2431